



## Differentiation on the Basis of Subject Specialization and Distribution of Roles in Improving Physical Training of Female Students of Pedagogical Specialties in Volleyball Classes

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**ABSTRACT:** The study is devoted to the analysis of the differentiation of physical training of female students of pedagogical specialties in volleyball classes, taking into account subject specialization and distribution of game roles. The aim of the work is to substantiate the differentiation on the basis of subject specialization and distribution of game roles in the improvement of physical training of female students of pedagogical specialties in volleyball classes. To achieve this goal, a comprehensive study was conducted, which included observation, survey, and analysis of specific requirements for physical training in different roles. The observation covered classes and training sessions, and the survey allowed us to identify the peculiarities of students' perception and attitude to the training process, as well as their preferences for physical activity and roles that correspond to their professional fields. The survey involved 46 female respondents, which allowed us to get a clear picture of the adaptation of training programs for different categories of students. The results of the study confirmed that specialization in playing roles (attacker, setter, libero) can significantly increase the effectiveness of the training process, taking into account the physiological and psychological characteristics of female students. The generalized results demonstrate that the roles of attacker and setter are optimal for female students of STEM fields, setter for humanities, attacker for future physical education teachers, and libero for primary school students. The developed recommendations can be used to improve the methodology of physical education in higher education institutions, contributing to the effective combination of sports training with future teaching activities.

**KEYWORDS:** improvement of physical training, female students, pedagogical specialties, volleyball, differentiation, subject specialization, distribution of roles, education

### PROBLEM STATEMENT

Traditional approaches to physical education of female students of higher education institutions (HEIs) often do not take into account their individual characteristics and physiological characteristics, as well as their professional needs. Women's bodies have specific requirements for physical activity due to hormonal, anatomical, and functional differences. And the future professional activity of a teacher involves not only static loads (standing at the blackboard for a long time, writing notes), but also dynamic actions related to the organization of the educational process, which require agility, coordination, and general endurance. Therefore, along with the issue of physical training of female students of pedagogical specialties, the problem of identifying a possible basis for the implementation of a differentiated methodology for improving the physical training of female students of pedagogical specialties in volleyball classes is actualized.

### ANALYSIS OF CURRENT RESEARCH

Modern researches emphasize the necessity of individualization of physical training of female students engaged in volleyball, taking into account their physiological and psychological features (Deminskaya, 2019; Fedorenko, 2021; Mishchenko & Sushko, 2021). In particular, the emphasis is on the development of specific physical qualities necessary for the effective performance of functions in a certain role, such as forward, blocker, or point guard (Dudko & Grygus, 2022). This not only improves the effectiveness of the training process but also contributes to the formation of professional competencies of future teachers.

Considering the subject specialization of female students is also an important factor in the process of physical training (Andreeva & Petrova, 2020; Baranov & Kolumbet, 2021). For example, students who specialize in teaching physical education may have different needs and goals than those who choose other pedagogical areas (Kovalenko & Tsaruk, 2020; Pavlenko, 2019). Thus,

a differentiated approach allows us to adapt the learning process to the specific needs and capabilities of each student, which in turn increases motivation and learning efficiency.

Current trends in education emphasize the importance of developing students' skills in independent planning and assessment of their own physical fitness (Sidorov & Hrebenyuk, 2020; Tkachuk & Kachur, 2022). This is especially true in the context of the introduction of a competence-based approach in education, where it is important not only to acquire knowledge but also to develop the skills necessary for professional activity.

Thus, the study of the differentiation of physical training of female students of pedagogical specialties in volleyball classes, taking into account subject specialization and distribution of roles, is relevant. Therefore, the **aim** of the research is to substantiate differentiation on the basis of subject specialization and distribution of roles in the improvement of physical training of female students of pedagogical specialties in volleyball classes.

## RESEARCH METHODS

We carried out a theoretical analysis of scientific and methodological literature, regulatory documents, and current research in the field of sports pedagogy, volleyball, physical training, and a differentiated approach in the educational process. This made it possible to identify scientific approaches to improving physical training, in particular in the context of subject specialization (specialty of pedagogical training) and functional role in playing activities (role of a volleyball player). We carried out a standardized pedagogical observation of volleyball training sessions conducted in groups of female students of pedagogical specialties. The main purpose of such observation was to record typical features of physical training organization, level of individualization of loads, presence or absence of differentiation by role, and taking into account the subject specialization of female students. To identify the attitude of female students to physical training in volleyball classes and the level of awareness of the principles of distribution of the role and subject specialization, a questionnaire was used, in which 46 respondents of pedagogical specialties (directions: STEM, humanitarian, physical culture) took part.

## RESULTS

Pedagogical specialties require endurance, coordination, and speed of reaction. For girls, future teachers of various subjects, volleyball as a means of physical development has a double value: it provides general physical development, which can be perceived as preparation for professional stress, and the development of pedagogical skills in the context of learning an individual approach through their own experience. Today, all teachers in general secondary education can be divided into age groups of students (primary school teachers, middle school teachers, high school teachers) or subject areas (teachers of humanities (e.g., language, history, music), teachers of STEM subjects (mathematics, computer science, physics, biology, chemistry), physical education teachers). This classification makes it possible to compare the specifics of professional activity and the game of volleyball (Table 1a-1b).

**Table 1a. Characteristics of subject teachers and peculiarities of their professional activity in the context of volleyball**

Area	Physical activity	Key skills	An analogy in volleyball
Primary school teachers	Stand a lot, bend down to children, work with small objects (pencils, paper, handouts), and change activities frequently	fine motor skills, quick reaction, endurance to static postures, coordination	Reaction ball games (e.g., catching the ball from different trajectories), balance exercises, and throwing the ball at the target to develop accuracy coordination exercises
Secondary school teachers	Combining static work (writing on the board, explaining the material) and active movement around the classroom Support for interactivity	Resistance to fatigue, attention span, and overall endurance	Combination exercises (e.g., passing the ball after moving quickly), games with changing positions to train adaptability Developing endurance through long games Concentration training during the game
High school teachers	More lecture work (prolonged standing/sitting), intense work with technical equipment (projectors, computers)	Static endurance, concentration Ability to work attentively for a long time Reaction speed (for discipline control)	Stabilization exercises (e.g., receiving the ball in a standing position), strategic games with an emphasis on tactics instead of speed Games with a reduced area (training to react quickly to chaotic situations, as in the classroom)

**Table 1b. Characteristics of subject teachers and peculiarities of their professional activity in the context of volleyball**

Area	Specifics	Physical aspects	Comment (why it is worth highlighting)	Volleyball analogies
Humanitarian	They talk a lot, use gestures, work with texts, and sometimes hold instruments (music)	Tension of the vocal cords, fine motor skills (writing, playing instruments), and the need to relieve the neck and shoulders	Exercises are needed to relax the back muscles and develop breathing and stress resistance. Breathing exercises after games (imitation of the "lesson" pace)	Games with the ball for accuracy (for example, serving in a given area), exercises with ball rotation for the development of the hand apparatus. Breathing exercises between games (prevention of stress on the vocal cords)
STEM teachers	Prolonged sitting at a computer, working with small details (laboratory instruments), and analytical thinking	Risk of posture disorders, eye strain, and physical inactivity. Spatial orientation, accuracy	Useful exercises for stretching and improving blood circulation. Exercises to calculate the trajectory of the ball (analogous to solving logic problems)	Dynamic movements (for example, "shuttle" running between zones), exercises on receiving the ball after a long sitting period. Passing accuracy, tactical combinations
Physical education teachers	High physical activity, the need to demonstrate exercises, risk of injury	General endurance, strength, flexibility, coordination	Special training is required to prevent occupational overload (e.g., shoulder girdle muscles)	Strength elements (e.g., powerful attacks) and jumping exercises to develop leg muscles

Taking into account the direction of subject training in the differentiated methodology for pedagogical specialties has a double purpose: to prepare the body for specific professional loads and to consciously form through sports (volleyball) those qualities that will become the basis of pedagogical skills (skills of individual approach, stress resistance, ability to demonstrate exercises).

Thus, taking into account the subject orientation also makes it possible to differentiate the methods of developing female students' physical fitness. For example, for teachers of humanities, it will be important to emphasize teamwork (communication training), simplified rules with more pauses, and exercises with commentary on actions (development of speech and breathing). For STEM teachers, precisely calculated passes (angle, force of impact), logical game combinations, statistical analysis of their own game, and prevention of physical inactivity will be appropriate. For primary school teachers, elements of game pedagogy are important, as well as exercises with mini-balls (fine motor skills and reaction) and simulation of learning situations. Therefore, the pedagogical specificity of the future professional activity of female students is not just differentiation by subject, but a way of purposeful formation of professionally important qualities through subject-oriented game situations, development of physical parameters necessary for a particular specialty, and modeling of future pedagogical scenarios in a game form. This approach turns standard volleyball training into an auxiliary tool for professional development.

#### *Differentiation based on the distribution of roles in volleyball*

For pedagogical specialties, the distribution of roles in volleyball is transformed into a tool for the development of professional qualities:

- Hitters (in the simulation of pedagogical situations, hitter = "teacher in the classroom") are responsible for performance, speed of reaction, so this role is suitable for future physical education teachers (physical strength, demonstration of technique), STEM teachers (accuracy, trajectory calculation) and primary school teachers (emotionality, ability to capture attention). This role

additionally develops confidence (important for classroom management), trains quick decision-making, and improves spatial orientation;

- Linkers/ passers (in the simulation of pedagogical situations, the linker = "methodologist") act as game organizers (strategists), so this role is suitable for teachers of philology (communication skills) and teachers-organizers (organizational skills, understanding of group dynamics). This role provides professional benefits such as developing systemic thinking, improving skills in correcting the actions of others, and practicing multitasking;

- Libero/defenders (in simulated pedagogical situations, libero = "classroom teacher") act as masters of insurance and concentration, and therefore this role is best suited for primary school teachers (attention to detail), social workers (conflict prevention), and special education teachers (support for weak links). An additional professional aspect here is the development of anticipation of situations, training in stress resistance, and improving responses to non-standard situations.

It is worth noting that specialization by playing roles (attacker, setter, libero) in the context of training future teachers is based on the principles of individualizing the workload, taking into account physiological characteristics and professional requirements. A generalization of the above considerations is presented in Table 2.

**Table 2. Subject-oriented adaptation of the game role**

Area	Recommended role	Training accent
STEM	Striker/Binder	Gear accuracy, angle calculation
Humanitarian	Binding	Verbal communication during the game
Physical education teachers	Attacker	Demonstration of the perfect technique
Primary school teachers	Libero	Exercises for peripheral vision

Generalization of the results of subject-oriented adaptation of the role in the context of training future teachers shows the expediency of taking into account both the professional specialization of female students and their potential strengths in accordance with the requirements of a specific role in volleyball. For female students majoring in STEM fields, it is advisable to perform the functions of an attacker or a setter, as these roles require accuracy, spatial thinking, and rational calculation of actions. Women in the humanities are more effective in the role of liaison due to their developed communication skills, which are key to organizing teamwork. At the same time, female students preparing to teach physical education can effectively realize themselves in the role of strikers, as demonstrating perfect technique meets both educational and pedagogical objectives. Female students, future teachers of primary education, most often show potential in the function of libero, where reaction speed, peripheral vision, and stability in the game are important. Thus, individualization of training by role on the basis of subject specialization allows for the increase of motivation for training, improves the effectiveness of the training process, and creates prerequisites for the realization of pedagogical potential in the conditions of a sports game.

## DISCUSSION

The scientific substantiation of this conclusion about specialization by a role as a tool of professional development is found: in the work (Kovalenko et al., 2021) on the theoretical foundations of a professionally oriented approach in physical education, in research (Lee & Schmidt, 2025; Sheppard & Young, 2020) on the psychological and pedagogical aspects of specialization by role, in the article (Gabbett, 2016) on the influence of playing positions on the development of professional competence, in the study (Nosko et al., 2015) on the methodology of using volleyball in the professional training of specialists, in the publication (Hortigüela-Alcalá et al., 2021). about the relationship between game roles and pedagogical skills. The main conclusions of these studies are: (a) specialization by role develops specific professional qualities (attacker - determination, strategic thinking; linker - communication, prompt decision-making; libero - concentration, speed of reaction); (b) subject specialization correlates with the role (STEM disciplines - accuracy, calculation of trajectories as an analogy to mathematical calculations; humanities disciplines - tactical analysis, strategic planning); (c) the possibility of forming pedagogical skills through situational learning (game-based learning), development of cognitive-motor connections and modeling of pedagogical situations in the game process. The above sources prove that specialization in volleyball has a clear scientific basis, meets the principles of professional pedagogy, provides transfer of skills from playing activities to pedagogical practice, and can be adapted to specific subject specialties.

During the observation, it was found that most classes are conducted according to a single template, without taking into account the functional role in the team or the specifics of the professional direction of future activities. The dominance of general developmental exercises over special means aimed at improving game actions within a certain role was recorded. Also, a low level of pedagogical individualization, limited diagnostics of physical fitness, and the absence of corrective influences were revealed. The obtained results confirm the feasibility of introducing a differentiated approach as a means of improving the effectiveness of physical

training in the context of personal and professional development of future teachers. Below are the questions and distribution of answers according to the results of the survey (Table 3).

**Table 3. Survey results**

№	Question	Answers	Results
1	Does the teacher take your specialty into account when organizing volleyball lessons?	Yes Partial No	9 (20%) 12 (26%) 25 (54%)
2	Do you know your role (functional role in the team) when playing volleyball?	Yes, clearly Approximately I don't know	10 (22%) 15 (33%) 21 (45%)
3	What goals do you consider to be the main ones for yourself while practicing volleyball?	Form Skills Health Socialization	20 (43%) 10 (22%) 12 (26%) 4 (9%)
4	Do you think that the exercises during the classes are within your physical capabilities?	Yes Partial No	14 (30%) 18 (39%) 14 (30%)
5	Do you have any experience of participating in volleyball competitions or tournaments?	Regularly Occasionally Never	7 (15%) 19 (41%) 20 (44%)
6	How important do you think it is to distribute roles in the team during classes?	Very Important Not required	18 (39%) 20 (43%) 8 (17%)
7	Would you like the volleyball training program to be tailored to your specialty?	So All the same No	36 (78%) 6 (13%) 4 (9%)
8	What approach to organizing classes do you find most effective?	The only one By level By role	10 (22%) 14 (30%) 22 (48%)
9	How do you assess your level of physical fitness?	High Medium Low	5 (11%) 26 (56%) 15 (33%)
10	Have you been interested in methods of improving your sports skills according to your role?	Yes Partial No	9 (20%) 17 (37%) 20 (43%)

The results of the survey indicate insufficient individualization of volleyball classes in the context of the professional orientation of female students. Only 20% of the respondents said that the teacher takes into account their specialty when organizing classes, while the majority (54%) believe that such adaptation does not occur at all. At the same time, only 22% of respondents are clearly aware of their own role in a team game, and almost half do not know their functional role. This indicates the limited implementation of the principles of differentiation and role specialization, which are key to the development of playing skills in volleyball.

The majority of female students believe that the main purpose of classes is to maintain physical fitness (43%), which also correlates with an average or low level of self-assessment of their own physical fitness (89% in total). At the same time, the vast majority of respondents (78%) express a desire for the training program to take into account their professional field, and 48% prefer to organize classes by role, which indicates a high need for structured differentiation based on individual capabilities and playing experience. In addition, 80% of respondents are partially or completely unfamiliar with the methods of improving their skills in accordance with their roles, which indicates the need for targeted theoretical and practical support.

Thus, the results of the survey confirm the expediency and relevance of the substantiation and implementation of the model of differentiation of physical training on the basis of subject specialization and distribution of the role as a means of improving the effectiveness of volleyball classes for female students of pedagogical specialties.



## CONCLUSION

An important result of the study was the theoretical substantiation of the connection between the subject specialization of female students and the optimal type of their physical activity in volleyball classes. In particular, it was found that exercises that develop spatial thinking and movement accuracy were effective for future STEM teachers, while for humanities students, classes aimed at developing communication skills and teamwork are more useful. This confirms the need to take into account professional specifics when developing training programs. The division into playing roles in volleyball has also proven to be an effective tool for professional development. It has been found that the position of a hitter promotes the development of determination and strategic thinking, while the role of a setter improves communication skills and the ability to make quick decisions. These qualities are key for pedagogical activity, which confirms the expediency of using volleyball as a means of professional training of future teachers. The obtained results indicate an insufficient level of consideration of individual characteristics of female students during volleyball classes, which further confirms the relevance of developing a differentiated physical training program taking into account professional specialization and functional distribution of game roles.

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